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ENGINEERING DEVELOPMENT FOR A SMALL-SCALE RECIRCULATOR EXPERIMENT*

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Lawrence Livermore National Laboratory (LLNL) is evaluating the physics and technology of recirculating induction accelerators for heavy-ion inertial-fusion drivers. As part of this evaluation, we are building a small-scale recirculator to demonstrate the concept and to use as a test bed for the development of recirculator technologies. The recirculator is based on the conventional linear induction accelerator concept, however there are several unique challenges that arise due to its circular nature, e.g. the need for non-intercepting diagnostics, precision time-varying beam centroid control and precision time-varying acceleration.

System designs have been completed and components are presently being designed and developed for the small-scale recirculator. The hardware being developed includes both mechanical and electrical components of the beamline. We are primarily focusing our immediate efforts in two areas; 1) the design of the modular beamline component called a "half-lattice period" which must satisfy challenging space and vacuum requirements and 2) the development of an advanced solid-state modulator which will generate precisely tailored electrical pulses at repetition rates exceeding 100 kHz for acceleration.

The half-lattice period must perform several functions including acceleration, bending, steering and diagnosis of the beam in a very constrained space. Space constraints and performance requirements necessitate a very close coordination of the mechanical design of the beamline components with the design of the electronic components required to energize the beamline. Beam acceleration is a good example of where the electronic design and packaging must be integral to the half-lattice period hardware.

This paper will discuss results of the design and development activities that are presently being conducted to implement the small-scale recirculator experiments. An overview of the system design will be presented along with a discussion of the implications of this design on the mechanical and electrical hardware. The paper will focus primarily on discussions of the development and design of the half-lattice period hardware and the advanced solid-state modulator.

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